WHAT IS CLAIMED IS:

1. A power supply system, comprising:

a controller configured to cause a regulator to produce a principle supply voltage and a secondary supply voltage, said regulator for coupling to a power source and to a microelectronics device to supply said principal supply voltage and said secondary supply voltage to said microelectronics device,

wherein said controller is further configured to maintain said principal supply voltage within a tolerance level bounded at a principal supply upper limit by a first reliability voltage value and bounded at a principal supply lower limit by a second reliability voltage value, and to maintain said secondary supply voltage within a second tolerance level bounded at a secondary supply upper limit by the first reliability voltage value and bounded at a secondary supply lower limit by a third reliability voltage value, said principal supply voltage and said secondary supply voltage determined in accordance with a gain factor by a voltage-current loadline, said first reliability voltage is determined by multiplying one plus a tolerance level by a first input voltage required value and the second tolerance level for the secondary supply voltage has a large first percentage of tolerance for the secondary supply upper limit and a significantly smaller second percentage of tolerance for the secondary supply limit.

2. The regulator of claim 1, wherein said controller is further configured to adjust said gain factor as required to produce said principal supply voltage and said secondary supply voltage according to said voltage-current loadline, wherein said loadline specifies a linear relationship for said primary supply voltage and said secondary supply voltage.

3. The regulator of claim 1, wherein said controller is further configured to adjust said gain factor as required to produce said primary supply voltage and said secondary supply voltage according to said voltage-current loadline, and wherein said voltage-current loadline specifies a total power voltage-current relationship.

4. The regulator of claim 1, wherein said controller is further configured to adjust said gain factor as required to produce said primary supply voltage and said secondary supply voltage according to said loadline, and wherein said voltage-current

loadline specifies a non-linear relationship for said primary supply voltage and said secondary supply voltages.

5. The regulator of claim 4, wherein said non-linear loadline further includes a discontinuity corresponding to an intermediate current value between zero and maximum, associated with said microelectronics device.

6. A regulator, comprising:

a plurality of regulator circuits for coupling to a microelectronics device to provide a plurality of regulated input voltages to said microelectronics device, the plurality of regulated input voltages being maintained within an input voltage range bounded at an upper limit by a first reliability voltage value, the first reliability voltage value determined by multiplying a first one of the plurality of regulated input voltages by the sum of one and a tolerance level, wherein each regulator circuit provides a particular one of said plurality of regulated input voltages to said microelectronics device,

wherein each said regulator circuit further includes:

a controller including a comparator and a threshold detector, an input of said comparator being coupled to the output of said threshold detector,

a switch coupled to said controller and operating in response to a signal provided by said controller, said switch connected to an inductor, a diode, and an output capacitor arranged in a network that produces a load current in response to an input source voltage received via said switch, and

a current sense feedback network connected to said network output and having a gain factor, said feedback network coupled to said threshold detector to cause said threshold detector to produce an output signal as a product of said gain factor,

the controller being configured to produce one of said plurality of regulated input voltages by varying the duty cycle of said switch in accordance with a voltage current loadline,

and to maintain said one of said plurality of regulated input voltages within an input voltage range bounded at a lower limit, and

the lower limit for said one of said plurality of regulated input voltages being computed by said controller in order to maintain said one of said plurality of regulated input voltages in

accordance with said voltage-current loadline of said one of said plurality of regulated input voltages for different values of said load current.

7. The regulator of claim 6, wherein said controller is further configured to determine said gain factor in order to produce said one of said plurality of regulated input voltages according to said voltage-current loadline, wherein said voltage-current loadline specifies a linear relationship for said one of said plurality of regulated input voltage required values.

8. The regulator of claim 6, wherein said controller is further configured to adjust said gain factor as required to produce said one of said plurality of regulated input voltages according to said voltage-current loadline, and wherein said voltage-current loadline specifies a total power voltage-current relationship.

9. The regulator of claim 6, wherein said controller is further configured to adjust said gain factor as required to produce said one of said plurality of regulated input voltages according to said voltage-current loadline, and wherein said voltage-current loadline specifies a non-linear relationship for said one of said plurality of input voltage required values.

10. The regulator of claim 9, wherein said non-linear loadline further includes a discontinuity corresponding to an intermediate current value between zero and maximum, associated with said microelectronics device.

11. An electronic system, comprising:

a microelectronics device having at least two input voltage required values to receive at least two input supply voltages;

a regulator coupled to said microelectronics device; and

a power source coupled to said regulator,

wherein said regulator is configured to produce said at least two supply voltages within an input voltage range bounded by an upper limit and a lower limit,

said upper limit of each of said at least two input supply voltages is a first reliability voltage value, said first reliability voltage value is determined by multiplying one plus a tolerance level by a first input voltage required value, and

said lower limit of at least one of said at least two input supply voltages is determined by one minus a tolerance level multiplied by each of said at least two input supply voltage required values.

12. The electronic system of claim 11, wherein said controller is further configured to adjust said gain factor to produce at least one of said at least two input supply voltages in accordance with said voltage-current loadline, wherein said voltage-current loadline specifies a linear relationship for said regulated input voltage required values.

13. The electronic system of claim 11, wherein said controller is further configured to adjust said gain factor to produce at least one of said at least two input supply voltages in accordance with said voltage-current loadline, wherein said loadline specifies a total power voltage-current relationship.

14. The electronic system of claim 11, wherein said controller is further configured to adjust said gain factor to produce at least one of said at least two input supply voltages in accordance with said voltage current loadline, wherein said loadline specifies a non-linear relationship for said plurality of input voltage required values.

15. The electronic system of claim 14, wherein said non-linear loadline further includes a discontinuity corresponding to an intermediate current value between zero and maximum, associated with said microelectronics device.

16. A regulating method, comprising:

supplying multiple input voltages to one or more microelectronics devices, each of said multiple input voltages including a corresponding input voltage required value;

determining an upper limit of the voltage regulation range for all of said multiple input voltages by multiplying a first corresponding input voltage required value by a sum of one plus a tolerance level;

determining a lower limit of a voltage regulation range for said multiple input voltages by a gain factor in accordance with a corresponding voltage-current loadline; and

maintaining each of said multiple input voltages supplied to said microelectronics devices above said lower limit of said voltage regulation range and under said first reliability voltage.

17. The regulating method of claim 16, wherein said voltage-current loadline specifies a linear relationship for said regulated input voltage required values.

18. The regulating method of claim 16, wherein said voltage-current loadline specifies a total power voltage-current relationship.

19. The regulating method of claim 16, wherein said voltage-current loadline specifies a non-linear relationship for said plurality of input voltage required values.

20. The regulating method of claim 19, wherein said non-linear relationship further includes a discontinuity corresponding to an intermediate current value between zero and maximum, associated with said microelectronics device.